DATA SHEET

M9415A
VXT PXIe Vector Transceiver
380 MHz to 12 GHz

KEYSIGHT TECHNOLOGIES

Table of Contents

Technical Specifications

Definitions and conditions

Specifications describe the warranted performance of calibrated instruments. Data represented in this document are specifications under the following conditions unless otherwise noted.

- Specifications are valid from 45 to 75 °C for individual module temperature, as reported by the module, and 20 to 35 °C for environment temperature unless otherwise noted
- Calibrated instrument has been stored for a minimum of 2 hours within the allowed operating range
- If instrument has previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range, instrument must have been stored for a minimum of 2 hours within the allowed operating range before turn-on
- 45-minute warm-up time with the Modular TRX application running
- Calibration cycle maintained
- When used with Keysight M9300A frequency reference and Keysight interconnect cables
- An “All Alignment” has been run within the previous 7 days
- A “Fast Alignment” has been run:
  - Within the previous 8 hours
  - If the environmental temperature has changed more than 5°C from the previous Fast Alignment

Typical describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 95 percent of the units exhibit with a 95 percent confidence level. This data does not include measurement uncertainty and is valid only at room temperature (approximately 25 °C) after alignment within the stated alignment time and temperature limits.

Nominal values indicate expected performance or describe product performance that is useful in the application of the product but are not covered by the product warranty.

Recommended best practices in use

- Use slot blockers and EMC filler panels in empty module slots to ensure proper operating temperatures. Keysight chassis and slot blockers optimize module temperature performance and reliability of test.
- Set chassis fan to high at environmental temperatures above 35 °C.

Vector Signal Analyzer

Performance		
Capture depth		
Standard (Option M02)	256 MSa of IQ data	
Option M05	512 MSa of IQ data	
Frequency		
Frequency range		
Option F06	380 MHz to 6 GHz	
Option F08	380 MHz to 8 GHz	
Option F12	380 MHz to 12 GHz	
Frequency reference		
Accuracy, aging rate, stability	Refer to M9300A specifications	
Measurement Frequency Accuracy (CW mode)		
Accuracy	(Transmitter frequency x frequency reference accuracy) ± 50 Hz, typical	
Resolution	1 Hz	
Analysis Bandwidth		
Standard (Option B4X)	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 12 GHz	400 MHz
Option B8X	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 2 GHz	600 MHz
	2 to 12 GHz	800 MHz
Option B12	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 2 GHz	600 MHz
	2 to 12 GHz	1.2 GHz
Triggering		
Trigger		
IQ analyzer	Free run, External 1, External 2, RF burst, Video, Periodic, PXI, Internal	
Trigger delay range	–150 to 500 ms	
Resolution	1/sample rate	
Maximum safe input level		
Average power input		
RF input port	+27 dBm	
Option HDX, Half duplex port	+27 dBm	
DC volts		
RF input port	30 Vdc	
Option HDX, Half duplex port	30 Vdc	

Absolute Amplitude Accuracy (CW mode) [1]			
RF input port			
Frequency Range	–70 dBm ≤ Input level < +10 dBm	+10 dBm ≤ Input level ≤ +20 dBm	+20 dBm < Input level ≤ +27 dBm
380 MHz to 1.31 GHz	< ± 0.50 dB, *< ± 0.20 dB typical*	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 1.00 dB, *< ± 0.70 dB typical*
1.31 to 4.3 GHz	< ± 0.60 dB, *< ± 0.25 dB typical*	< ± 0.65 dB, *< ± 0.30 dB typical*	< ± 1.00 dB, *< ± 0.65 dB typical*
4.3 to 8.4 GHz	< ± 0.55 dB, *< ± 0.25 dB typical*	< ± 0.55 dB, *< ± 0.25 dB typical*	< ± 0.75 dB, *< ± 0.40 dB typical*
8.4 to 11.4 GHz	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 0.80 dB, *< ± 0.40 dB typical*	< ± 0.90 dB, *< ± 0.50 dB typical*
11.4 to 12 GHz	< ± 0.70 dB, *< ± 0.35 dB typical*	< ± 0.85 dB, *< ± 0.45 dB typical*	< ± 1.25 dB, *< ± 0.70 dB typical*
Half duplex port, Option HDX			
Frequency Range	–70 dBm ≤ Input level < +10 dBm	+10 dBm ≤ Input level ≤ +20 dBm	+20 dBm < Input level ≤ +27 dBm
380 MHz to 1.31 GHz	< ± 0.50 dB, *< ± 0.25 dB typical*	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 1.15 dB, *< ± 0.85 dB typical*
1.31 to 4.3 GHz	< ± 0.60 dB, *< ± 0.25 dB typical*	< ± 0.65 dB, *< ± 0.30 dB typical*	< ± 1.30 dB, *< ± 0.80 dB typical*
4.3 to 8.4 GHz	< ± 0.70 dB, *< ± 0.30 dB typical*	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 0.85 dB, *< ± 0.50 dB typical*
8.4 to 11.4 GHz	< ± 0.75 dB, *< ± 0.40 dB typical*	< ± 0.75 dB, *< ± 0.35 dB typical*	< ± 0.95 dB, *< ± 0.55 dB typical*
11.4 to 12 GHz	< ± 0.80 dB, *< ± 0.40 dB typical*	< ± 0.90 dB, *< ± 0.45 dB typical*	< ± 1.15 dB, *< ± 0.65 dB typical*

1. Signal is measured at 1.1 MHz offset from the center frequency, Otherwise, an IF flatness error must be added.

Input Voltage Standing Wave Ratio (VSWR), nominal		
	RF input port	**Half Duplex Port (configured to input mode)**
380 MHz to 4.3 GHz	< 1.3:1	< 1.4:1
4.3 to 5.8 GHz	< 1.2:1	< 1.3:1
5.8 to 7.2 GHz	< 1.6:1	< 1.7:1
7.2 to 10.2 GHz	< 1.3:1	< 1.3:1
10.2 to 12 GHz	< 1.8:1	< 1.8:1

Phase Noise Sidebands (CF = 1 GHz), typical (nominal, when using M9300A-S01)	
1 kHz offset	–114 dBc/Hz
10 kHz offset	–130 dBc/Hz
100 kHz offset	–134 dBc/Hz
1 MHz offset	–137 dBc/Hz
10 MHz offset	–141 dBc/Hz

Spurious Responses						
Residual responses, typical						
RF input port; Option HDX, half duplex port; with analyzer ranged to +10 dBm; offset from 10 MHz to 1/2 × analysis bandwidth						
380 MHz to 9 GHz	< –83 dBm					
9 to 9.6 GHz	< –80 dBm					
9.6 to 12 GHz	< –81 dBm					
Image responses, nominal						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	–63 dBc	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	–62 dBc	–60 dBc	N/A	N/A	N/A	N/A
s1.31 to 2 GHz	–62 dBc	–60 dBc	–60 dBc	–60 dBc	N/A	N/A
2 to 4.3 GHz	–62 dBc	–60 dBc	–60 dBc	–60 dBc	–58 dBc	–56 dBc
4.3 to 4.6 GHz	–63 dBc	–63 dBc	–60 dBc	–60 dBc	–58 dBc	–56 dBc
4.6 to 12 GHz	–63 dBc	–63 dBc	–60 dBc	–60 dBc	–59 dBc	–58 dBc
Sideband spurs, nominal						
1 kHz to 10 MHz offset	–85 dBc					

LO Feedthrough (dBr [1]), typical		
	RF input port, with analyzer ranged from –30 to +27 dBm	**Option HDX, half duplex port, with analyzer ranged from –25 to +27 dBm**
380 MHz to 12 GHz	–58 dBr	–58 dBr

1. dBr is LO feedthrough power relative to the range level of the receiver.

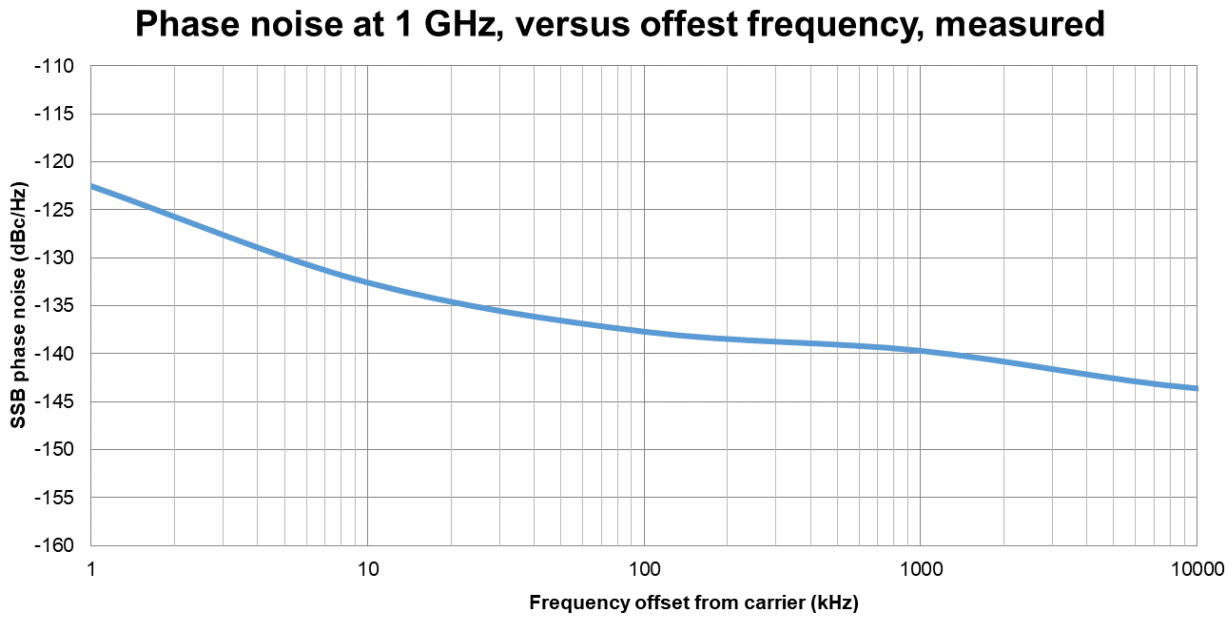

Figure 1. Phase noise from 1 kHz to 10 MHz offset at 1 GHz

Displayed Average Noise Floor (DANL) [1]		
	RF input port, with analyzer ranged to –70 dBm	**Half duplex port, Option HDX, with analyzer ranged to –70 dBm**
380 MHz to 4.3 GHz	–165 dBm, *–167 dBm typical*	–160 dBm, *–162 dBm typical*
4.3 to 10.2 GHz	–165 dBm, *–167 dBm typical*	–158 dBm, *–161 dBm typical*
10.2 to 12 GHz	–162 dBm, *–165 dBm typical*	–155 dBm, *–157 dBm typical*
Third-order Intermodulation Distortion (TOI, with analyzer ranged to +10 dBm), nominal		
380 MHz to 4.3 GHz	+35 dBm	
4.3 to 6 GHz	+32 dBm	
6 to 12 GHz	+30 dBm	

1. Input terminated, LNA on, log power average, and normalized to 1 Hz bandwidth.

IF Flatness						
RF input port, –25 dBm ≤ Input level ≤ +10 dBm						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	± 0.90 dB, *± 0.50 dB typical*	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	± 0.70 dB, *± 0.35 dB typical*	± 0.70 dB, *± 0.40 dB typical*	N/A	N/A	N/A	N/A
1.31 to 1.62 GHz	± 0.70 dB, *± 0.35 dB typical*	± 0.70 dB, *± 0.40 dB typical*	± 1.20 dB, *± 0.70 dB typical*	± 1.50 dB, *± 0.95 dB typical*	N/A	N/A
1.62 to 2 GHz	± 0.70 dB, *± 0.35 dB typical*	± 0.70 dB, *± 0.40 dB typical*	± 0.65 dB, *± 0.30 dB typical*	± 0.65 dB, *± 0.30 dB typical*	N/A	N/A
2 to 3.5 GHz	± 0.50 dB, *± 0.15 dB typical*	± 0.55 dB, *± 0.25 dB typical*	± 0.65 dB, *± 0.30 dB typical*	± 0.65 dB, *± 0.30 dB typical*	± 0.60 dB, *± 0.25 dB typical*	± 0.75 dB, *± 0.35 dB typical*
3.5 to 4.3 GHz	± 0.55 dB, *± 0.20 dB typical*	± 0.55 dB, *± 0.25 dB typical*	± 0.80 dB, *± 0.40 dB typical*	± 0.80 dB, *± 0.40 dB typical*	± 0.80 dB, *± 0.40 dB typical*	± 0.85 dB, *± 0.45 dB typical*
4.3 to 12 GHz	± 1.00 dB, *± 0.50 dB typical*	± 1.00 dB, *± 0.50 dB typical*	± 1.10 dB, *± 0.65 dB typical*	± 1.15 dB, *± 0.70 dB typical*	± 1.15 dB, *± 0.70 dB typical*	± 1.25 dB, *± 0.80 dB typical*
Half duplex port, Option HDX, –25 dBm ≤ Input level ≤ +10 dBm						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	± 0.90 dB, *± 0.55 dB typical*	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	± 0.70 dB, *± 0.35 dB typical*	± 0.80 dB, *± 0.40 dB typical*	N/A	N/A	N/A	N/A
1.31 to 1.62 GHz	± 0.70 dB, *± 0.35 dB typical*	± 0.80 dB, *± 0.40 dB typical*	± 1.15 dB, *± 0.70 dB typical*	± 1.55 dB, *± 0.95 dB typical*	N/A	N/A
1.62 to 2 GHz	± 0.70 dB, *± 0.35 dB typical*	± 0.80 dB, *± 0.40 dB typical*	± 0.60 dB, *± 0.30 dB typical*	± 0.60 dB, *± 0.30 dB typical*	N/A	N/A
2 to 3.5 GHz	± 0.45 dB, *± 0.15 dB typical*	± 0.55 dB, ± 0.25 dB typical	± 0.60 dB, ± 0.25 dB typical	± 0.60 dB, *± 0.25 dB typical*	± 0.65 dB, *± 0.30 dB typical*	± 0.70 dB, *± 0.35 dB typical*
3.5 to 4.3 GHz	± 0.50 dB, *± 0.20 dB typical*	± 0.60 dB, *± 0.20 dB typical*	± 0.75 dB, *± 0.40 dB typical*	± 0.75 dB, *± 0.40 dB typical*	± 1.00 dB, *± 0.55 dB typical*	± 1.35 dB, *± 0.80 dB typical*
4.3 to 12 GHz	± 0.85 dB, *± 0.40 dB typical*	± 1.00 dB, *± 0.50 dB typical*	± 1.10 dB, *± 0.60 dB typical*	± 1.25 dB, *± 0.70 dB typical*	± 1.30 dB, *± 0.75 dB typical*	± 1.35 dB, *± 0.80 dB typical*

Vector Signal Generator

Performance		
Arb sample memory (storage capacity)		
Standard (Option M02)	256 MSa of IQ data	
Option M05	512 MSa of IQ data	
Frequency		
Frequency range		
Option F06	380 MHz to 6 GHz	
Option F08	380 MHz to 8 GHz	
Option F12	380 MHz to 12 GHz	
Frequency reference		
Accuracy, aging rate, stability	Refer to M9300A specifications	
Signal Generation Bandwidth		
	Center frequency	**Maximum bandwidth**
Standard (Option B4X)	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 12 GHz	400 MHz
Option B8X	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 2 GHz	600 MHz
	2 to 12 GHz	800 MHz
Option B12	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 2 GHz	600 MHz
	2 to 12 GHz	1.2 GHz
Output Level Range (CW mode)		
RF output port		
380 MHz to 12 GHz	–120 to +5 dBm	
Option HDX, half duplex port (configured to output mode)		
380 MHz to 12 GHz	–120 to +5 dBm	
RF output port, Option 1EA		
380 MHz to 12 GHz	–120 to +20 dBm, +25 dBm settable	

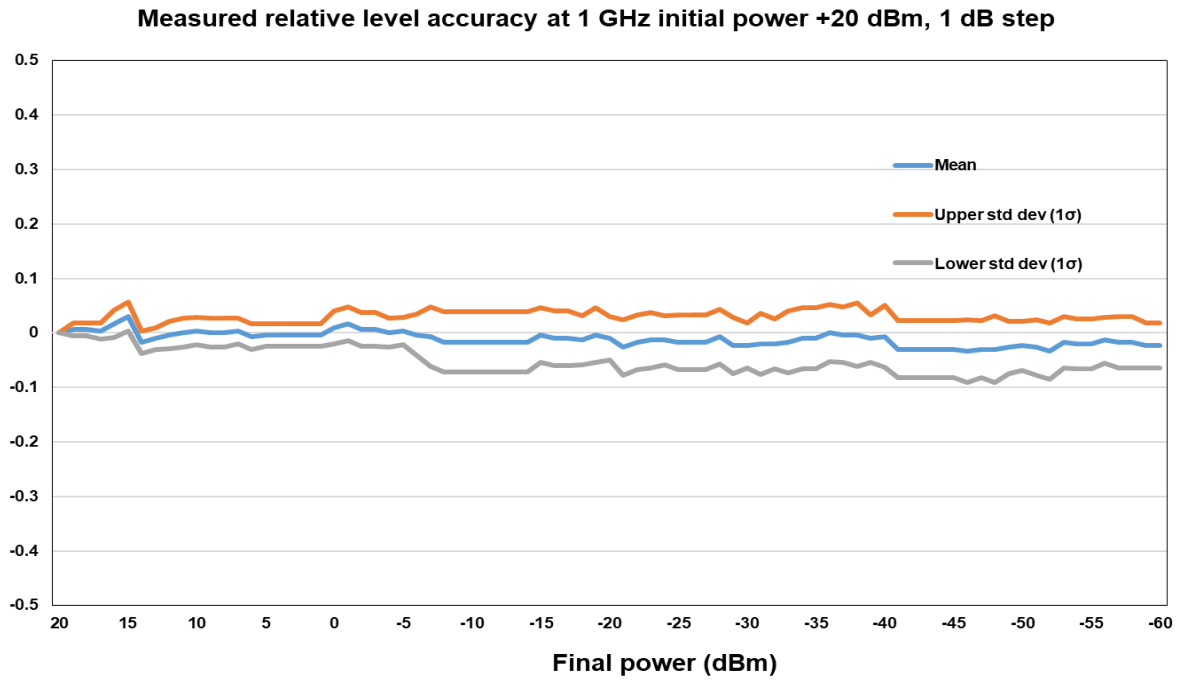

Figure 2. Measured relative level accuracy at 1 GHz

Absolute Level Accuracy (CW mode)						
RF output port, typical indicated by *italics*						
Frequency range	380 to 550 MHz	550 MHz to 4.3 GHz	4.3 to 6 GHz	6 to 7.8 GHz	7.8 to 10.2 GHz	10.2 to 12 GHz
+10 dBm < Level ≤ +20 dBm	< ± 0.60 dB, < ± *0.25 dB*	< ± 0.75 dB, < ± *0.35 dB*	< ± 0.90 dB, < ± *0.45 dB*	< ± 1.00 dB, < ± *0.45 dB*	< ± 0.85 dB, < ± *0.45 dB*	< ± 0.85 dB, < ± *0.45 dB*
+0 dBm < Level ≤ +10 dBm	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.65 dB, < ± *0.30 dB*	< ± 0.80 dB, < ± *0.40 dB*	< ± 0.85 dB, < ± *0.45 dB*	< ± 0.75 dB, < ± *0.35 dB*	< ± 0.65 dB, < ± *0.30 dB*
–60 dBm ≤ Level ≤ +0 dBm	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± 0.20 dB	< ± 0.75 dB, < ± *0.25 dB*	< ± 0.70 dB, < ± *0.20 dB*
–90 dBm ≤ Level < –60 dBm	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.65 dB, < ± *0.35 dB*	< ± 0.95 dB, < ± *0.50 dB*	< ± 0.75 dB, < ± *0.35 dB*	< ± 1.00 dB, < ± *0.50 dB*
–100 dBm ≤ Level < –90 dBm	< ± 0.75 dB, < ± *0.35 dB*	< ± 0.75 dB, < ± *0.40 dB*	< ± 0.70 dB, < ± *0.30 dB*	< ± 0.95 dB, < ± *0.50 dB*	< ± 0.75 dB, < ± *0.35 dB*	< ± 1.10 dB, < ± *0.50 dB*
–110 dBm ≤ Level < –100 dBm	< ± 0.85 dB, < ± *0.45 dB*	< ± 0.90 dB, < ± *0.55 dB*	< ± 0.90 dB, < ± *0.50 dB*	< ± 0.95 dB, < ± *0.55 dB*	< ± 0.85 dB, < ± *0.45 dB*	< ± 1.10 dB, < ± *0.60 dB*

Option HDX, half duplex port, typical indicated by *italics*						
Frequency range	380 to 550 MHz	550 MHz to 4.3 GHz	4.3 to 6 GHz	6 to 7.8 GHz	7.8 to 10.2 GHz	10.2 to 12 GHz
+0 dBm < Level ≤ +10 dBm	< ± 0.50 dB, < ± *0.20 dB*	< ± 0.50 dB, < ± *0.20 dB*	< ± 0.65 dB, < ± *0.30 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± *0.25 dB*	< ± 0.70 dB, < ± *0.40 dB*
–60 dBm ≤ Level ≤ +0 dBm	< ± 0.50 dB, < ± *0.20 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.65 dB, < ± *0.30 dB*	< ± 0.50 dB, < ± *0.25 dB*	< ± 0.70 dB, < ± *0.25 dB*	< ± 0.70 dB, < ± *0.30 dB*
–90 dBm ≤ Level < –60 dBm	< ± 0.50 dB, < ± *0.20 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.65 dB, < ± *0.30 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± *0.25 dB*
–100 dBm ≤ Level < –90 dBm	< ± 0.65 dB, < ± *0.35 dB*	< ± 0.65 dB, < ± *0.35 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± *0.30 dB*
–110 dBm ≤ Level < –100 dBm	< ± 0.80 dB, < ± *0.40 dB*	< ± 0.95 dB, < ± *0.55 dB*	< ± 0.70 dB, < ± *0.40 dB*	< ± 0.70 dB, < ± *0.40 dB*	< ± 0.65 dB, < ± *0.40 dB*	< ± 0.80 dB, < ± *0.50 dB*

Measured Amplitude Repeatability	
RF output port, +0 dBm output power, 1 GHz, 24 hours elapsed time without alignment, 25 °C	
Delta from initial value	< ± 0.10 dB nominal

Setting Resolution	
0.01 dB	

Output Voltage Standing Wave Ratio (VSWR), nominal	
RF output port, typical	
380 MHz to 1.31 GHz	< 1.75:1
1.31 to 7.8 GHz	< 1.65:1
7.8 to 10.2 GHz	< 1.75:1
10.2 to 12 GHz	< 1.90:1
Option HDX, half duplex port (configured to output mode)	
380 MHz to 1.31 GHz	< 1.75:1
1.31 to 6 GHz	< 1.40:1
6 to 10.2 GHz	< 1.55:1
10.2 to 12 GHz	< 1.75:1

Harmonics, typical	
RF output port	
+0 dBm output power	
380 MHz to 4.3 GHz	< –43 dBc
4.3 to 5.8 GHz	< –42 dBc
5.8 to 10.2 GHz	< –38 dBc
10.2 to 12 GHz	< –44 dBc
+10 dBm output power, with Option 1EA	
380 MHz to 4.3 GHz	< –34 dBc
4.3 to 5.8 GHz	< –33 dBc
5.8 to 9 GHz	< –30 dBc
9 to 10.2 GHz	< –28 dBc
10.2 to 12 GHz	< –34 dBc

Option HDX, half duplex port, +0 dBm output power	
380 MHz to 4.3 GHz	< –40 dBc
4.3 to 5.8 GHz	< –38 dBc
5.8 to 10.2 GHz	< –35 dBc
10.2 to 12 GHz	< –40 dBc

Non-harmonic Spurious (CW mode), nominal	
RF output port, Option HDX, half duplex port, +0 dBm output power	
380 MHz to 4.3 GHz	< –79 dBc
4.3 to 6.5 GHz	< –57 dBc
6.5 to 9.6 GHz	< –67 dBc
9.6 to 11.4 GHz	< –59 dBc
11.4 to 12 GHz	< –52 dBc

LO Feedthrough, nominal	
RF output port, Option HDX, half duplex port, > –30 dBm output power	
380 MHz to 1.31 GHz	–65 dBc
1.31 to 1.62 GHz	–56 dBc
1.62 to 2 GHz	–60 dBc
2 to 4.3 GHz	–56 dBc
4.3 to 12 GHz	–60 dBc

Image Responses, nominal						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	–65 dBc	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	–60 dBc	–60 dBc	N/A	N/A	N/A	N/A
1.31 to 2 GHz	–60 dBc	–60 dBc	–55 dBc	–54 dBc	N/A	N/A
2 to 12 GHz	–60 dBc	–60 dBc	–55 dBc	–54 dBc	–54 dBc	–52 dBc

Sideband Spurious, nominal			
Offset	380 MHz to 4.3 GHz	4.3 to 10.2 GHz	10.2 to 12 GHz
1 to 100 kHz offset	–85 dBc	–75 dBc	–75 dBc
100 kHz to 1 MHz offset	–95 dBc	–90 dBc	–75 dBc
1 to 10 MHz offset	–95 dBc	–90 dBc	–90 dBc

Phase Noise, typical (nominal, when using M9300A-S01)	
RF output port, +0 dBm; Option HDX, half duplex port, +0 dBm; Option 1EA, +10 dBm; Center frequency = 1 GHz	
1 kHz offset	≤ –115 dBc/Hz
10 kHz offset	≤ –133 dBc/Hz
100 kHz offset	≤ –138 dBc/Hz
1 MHz offset	≤ –143 dBc/Hz
10 MHz offset	≤ –143 dBc/Hz

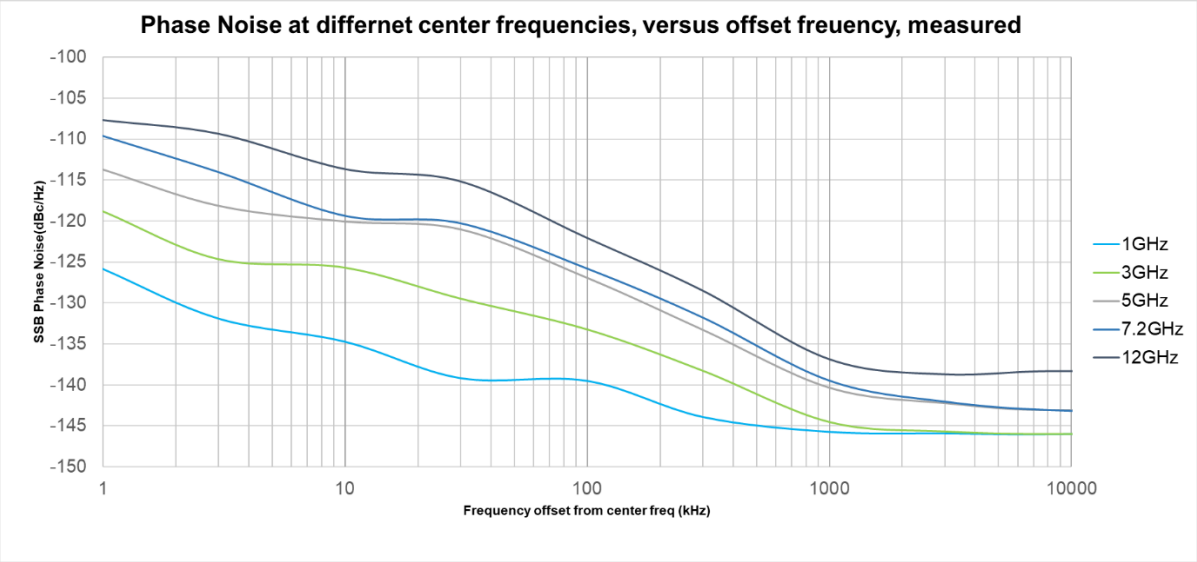

Figure 3. Measured phase noise from 1 kHz to 10 MHz offset at 1, 3, 5, 7.2 and 12 GHz

Broadband Noise Floor [1], nominal	
RF output port, output level = +0 dBm	
380 to 550 MHz	–139 dBm/Hz
550 MHz to 4.3 GHz	–140 dBm/Hz
4.3 to 10.2 GHz	–138 dBm/Hz
10.2 to 12 GHz	–137 dBm/Hz
Option HDX, half duplex port, output level = –10 dBm	
380 to 550 MHz	–148 dBm/Hz
550 MHz to 4.3 GHz	–149 dBm/Hz
4.3 to 10.2 GHz	–147 dBm/Hz
10.2 to 12 GHz	–145 dBm/Hz
Third-order Intermodulation Distortion (TOI), nominal	
RF output port, output level = +0 dBm	
380 MHz to 7.8 GHz	+28 dBm
7.8 to 10.2 GHz	+27 dBm
10.2 to 12 GHz	+24 dBm
Option HDX, half duplex port, output level = +0 dBm	
380 to 550 MHz	+28 dBm
550 MHz to 4.3 GHz	+27 dBm
4.3 to 7.8 GHz	+25 dBm
7.8 to 10.2 GHz	+23 dBm
10.2 to 12 GHz	+21 dBm

1. Measured at 10.1 MHz offset from the center frequency.

IF Flatness, typical						
RF output port, –30 dBm ≤ Input level ≤ +20 dBm						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	± 0.40 dB	N/A	N/A	N/A	N/A	N/A
550 to 680 MHz	± 0.40 dB	± 0.45 dB	N/A	N/A	N/A	N/A
680 to 730 MHz	± 0.55 dB	± 1.05 dB	N/A	N/A	N/A	N/A
730 MHz to 1.31 GHz	± 0.40 dB	± 0.45 dB	N/A	N/A	N/A	N/A
1.31 to 1.62 GHz	± 0.55 dB	± 0.55 dB	± 0.60 dB	± 0.70 dB	N/A	N/A
1.62 to 2 GHz	± 0.40 dB	± 0.45 dB	± 0.50 dB	± 0.50 dB	N/A	N/A
2 to 3.5 GHz	± 0.40 dB	± 0.45 dB	± 0.50 dB	± 0.50 dB	± 0.40 dB	± 0.60 dB
3.5 to 4.3 GHz	± 0.40 dB	± 0.45 dB	± 0.85 dB	± 1.00 dB	± 1.00 dB	± 1.00 dB
4.3 to 6 GHz	± 0.40 dB	± 0.45 dB	± 0.55 dB	± 0.55 dB	± 0.55 dB	± 0.75 dB
6 to 9 GHz	± 0.40 dB	± 0.45 dB	± 0.55 dB	± 0.55 dB	± 0.55 dB	± 0.55 dB
9 to 10.2 GHz	± 0.40 dB	± 0.45 dB	± 0.55 dB	± 0.60 dB	± 0.80 dB	± 1.10 dB
10.2 to 12 GHz	± 0.40 dB	± 0.45 dB	± 0.60 dB	± 0.65 dB	± 0.65 dB	± 0.65 dB
Half duplex port, Option HDX, –20 dBm ≤ Input level ≤ +10 dBm						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	± 0.40 dB	N/A	N/A	N/A	N/A	N/A
550 to 680 MHz	± 0.40 dB	± 0.50 dB	N/A	N/A	N/A	N/A
680 to 730 MHz	± 0.55 dB	± 1.00 dB	N/A	N/A	N/A	N/A
730 MHz to 1.31 GHz	± 0.40 dB	± 0.50 dB	N/A	N/A	N/A	N/A
1.31 to 1.62 GHz	± 0.60 dB	± 0.60 dB	± 0.60 dB	± 0.70 dB	N/A	N/A
1.62 to 2 GHz	± 0.40 dB	± 0.50 dB	± 0.60 dB	± 0.60 dB	N/A	N/A
2 to 3.5 GHz	± 0.40 dB	± 0.50 dB	± 0.60 dB	± 0.60 dB	± 0.40 dB	± 0.45 dB
3.5 to 4.3 GHz	± 0.40 dB	± 0.50 dB	± 0.60 dB	± 0.65 dB	± 0.70 dB	± 0.70 dB
4.3 to 6 GHz	± 0.40 dB	± 0.50 dB	± 0.60 dB	± 0.60 dB	± 0.60 dB	± 0.75 dB
6 to 9 GHz	± 0.40 dB	± 0.50 dB	± 0.60 dB	± 0.60 dB	± 0.60 dB	± 0.60 dB
9 to 10.2 GHz	± 0.40 dB	± 0.50 dB	± 0.60 dB	± 0.60 dB	± 0.65 dB	± 0.90 dB
10.2 to 12 GHz	± 0.40 dB	± 0.50 dB	± 0.60 dB	± 0.60 dB	± 0.65 dB	± 0.65 dB

General Specifications

Environmental Characteristics	
Operating temperature	0 to +45 °C
Storage temperature	–40 to +65 °C
EMC	Complies with European EMC Directive 2014/30/EU • IEC/EN 61326-1 • CISPR 11, Group 1, Class A • AS/NZS CISPR 11 • ICES/NMB-001 This ISM device complies with Canadian ICES-001 Cet appareil ISM est conforme a la norme NMB-001 du Canada
Environmental stress	Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to, temperature, humidity, shock, vibration, altitude, and power line conditions; test methods are aligned with IEC 60068-2 and levels are similar to MILPRF-28800F Class 3.
Maximum Power Consumption	
M9415A	126 W nominal
Weight	
Net	1.5 kg (3.3 lbs)
Dimension	
H x W x D	130.2 mm x 60.5 mm x 209.6 mm
Warranty	
The VXT PXIe vector transceiver is supplied with a 1-year warranty	
Calibration Cycle	
The recommended calibration cycle is one year; calibration services are available through Keysight service centers	

Front Panel

Reference	
Ref In, Ref Out	Frequency: 100 MHz
	Connector: MMPX female, 50 Ω nominal
	Lock range: ± 1 ppm, nominal
	Input amplitude: >+10 dBm, nominal
	Output amplitude: >+10 dBm, nominal
LO Reference	
2.4 GHz In, 2.4 GHz Out	Connector: MMPX female, 50 Ω nominal
	Input amplitude: >+10 dBm, nominal
	Output amplitude: >+12 dBm, nominal
RF Connections	
RF Input	Connector: SMA female, 50 Ω nominal
RF Output	Connector: SMA female, 50 Ω nominal
Half Duplex	Connector: SMA female, 50 Ω nominal

Trigger Connections	
Trigger 1, Trigger 2 (Input/Output, selectable)	Connector: MMPX female
	Input impedance: 1 kΩ or 50 Ω nominal
	Input level range: 0 to +3.3 V
	Output impedance: 50 Ω nominal
	Output level range: 3.3 V LVTTL
DIO Connections	
Ctrl M, Ctrl S	Connector: Micro-HDMI female
	Level range: 3.3 V LVTTL, LVDS

WLAN Measurement Application Key Specifications

Error Vector Magnitude (EVM)	
EVM floor conditions Phase Tracking on, Eq Smoothing on, Eq Training Seq only, RF output loopback to RF input, at –20 dBm input power, optimized range, nominal	
802.11ac 5.8 GHz 80 MHz	< –51 dB
802.11ac 5.8 GHz 160 MHz	< –50 dB
802.11ax 5.8 GHz 80 MHz	< –52 dB
802.11ax 5.8 GHz 160 MHz	< –50 dB
802.11ax 7 GHz 80 MHz	< –51 dB
802.11ax 7 GHz 160 MHz	< –50 dB

WLAN Source Key Specifications

Error Vector Magnitude (EVM)	
RF output port, at –5 dBm to –15 dBm output power, nominal	
802.11ac 5.8 GHz 80 MHz	< –51 dB
802.11ac 5.8 GHz 160 MHz	< –50 dB
802.11ax 5.8 GHz 80 MHz	< –52 dB
802.11ax 5.8 GHz 160 MHz	< –50 dB
802.11ax 7 GHz 80 MHz	< –51 dB
802.11ax 7 GHz 160 MHz	< –49 dB

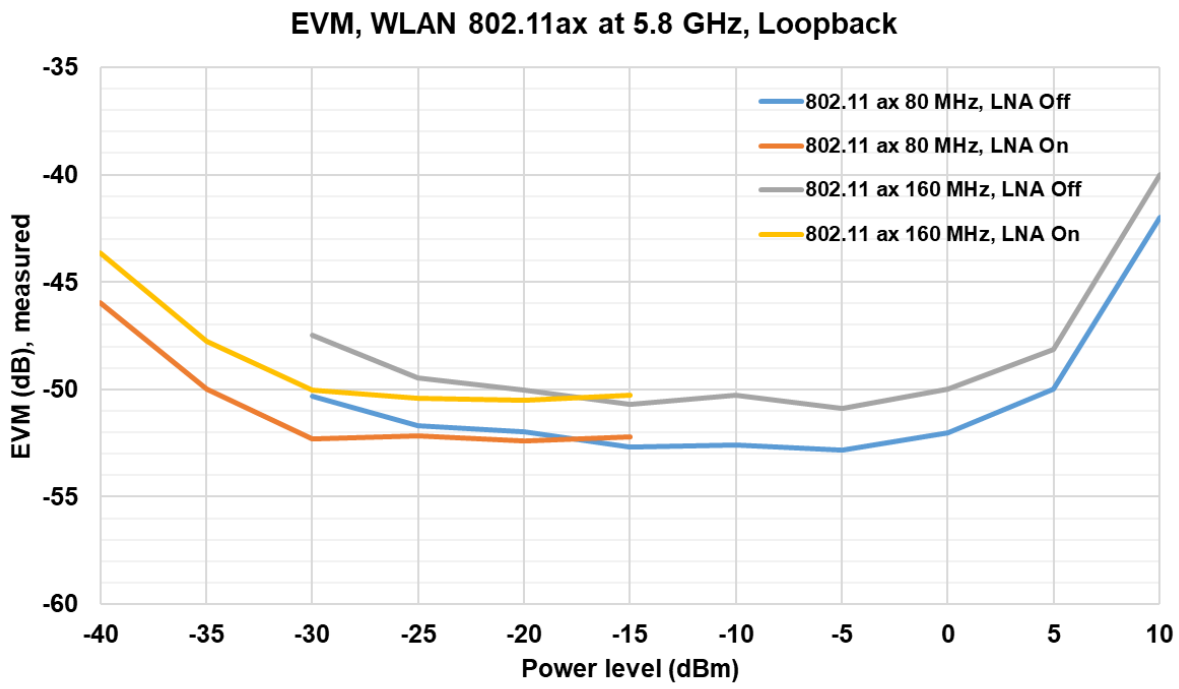

Figure 4. WLAN 802.11ax EVM vs. output power level at 5.8 GHz, loopback

5G NR Measurement Application Specifications

Transmit Power	
Absolute power accuracy	± 0.35 dB nominal at 0 dBm input power
Error Vector Magnitude (EVM)	
Residual EVM, RF output loopback to RF input, at –5 dBm input power, nominal	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	0.23%
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	0.27%
30 kHz SCS, 7 GHz, 100 MHz (256QAM)	0.28%
30 kHz SCS, 11 GHz, 100 MHz (256QAM)	0.35%
120 kHz SCS, 4 GHz, 200 MHz (256QAM)	0.28%
120 kHz SCS, 5 GHz, 200 MHz (256QAM)	0.36%
120 kHz SCS, 7 GHz, 200 MHz (256QAM)	0.35%
120 kHz SCS, 11 GHz, 200 MHz (256QAM)	0.41%
Residual EVM, RF output loopback to RF input, at –10 dBm input power, nominal	
120 kHz SCS, 4 GHz, 400 MHz (256QAM)	0.42%
120 kHz SCS, 5 GHz, 400 MHz (256QAM)	0.50%
120 kHz SCS, 7 GHz, 400 MHz (256QAM)	0.43%
120 kHz SCS, 11 GHz, 400 MHz (256QAM)	0.50%
120 kHz SCS, 7 GHz, 100 MHz 8CC (256QAM)	0.65%
120 kHz SCS, 11 GHz, 100 MHz 8CC (256QAM)	0.74%
Adjacent Channel Power	
RF input port, at –5 dBm input power, LNA off, noise correction on, nominal	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	–67.0 dBc
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	–66.0 dBc

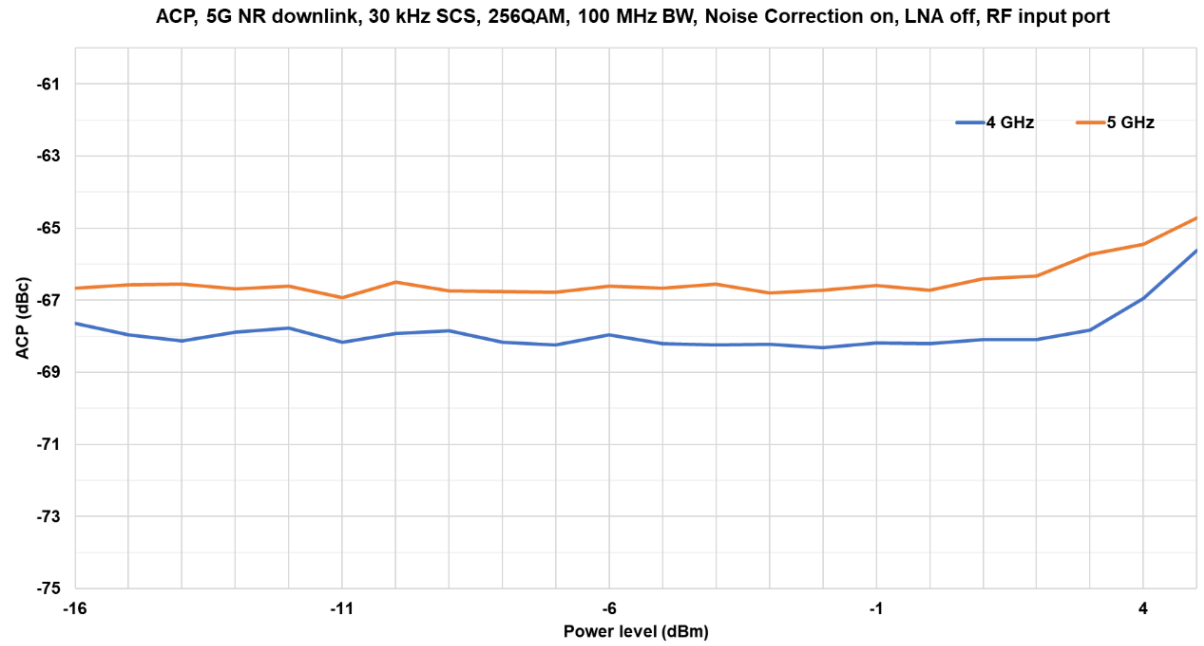

Figure 5. 5G NR downlink ACP vs. input power level, noise correction on, LNA off, 100 MHz bandwidth, 30 kHz SCS, 256QAM

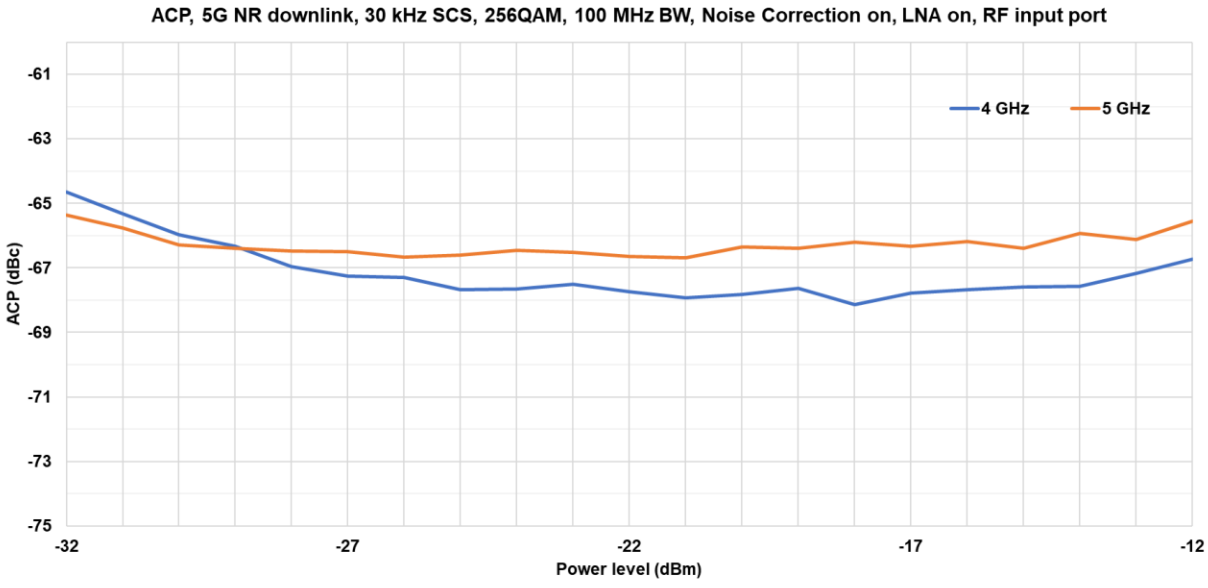

Figure 6. 5G NR downlink ACP vs. input power level, noise correction on, LNA on, 100 MHz bandwidth, 30 kHz SCS, 256QAM

5G NR Source Key Specifications

Error Vector Magnitude (EVM)	
Composite EVM, RF output loopback to RF input, at –5 dBm input power, nominal	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	0.23%
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	0.27%
30 kHz SCS, 7 GHz, 100 MHz (256QAM)	0.28%
30 kHz SCS, 11 GHz, 100 MHz (256QAM)	0.35%
120 kHz SCS, 4 GHz, 200 MHz (256QAM)	0.28%
120 kHz SCS, 5 GHz, 200 MHz (256QAM)	0.36%
120 kHz SCS, 7 GHz, 200 MHz (256QAM)	0.35%
120 kHz SCS, 11 GHz, 200 MHz (256QAM)	0.41%
Composite EVM, RF output loopback to RF input, at –10 dBm input power, nominal	
120 kHz SCS, 4 GHz, 400 MHz (256QAM)	0.42%
120 kHz SCS, 5 GHz, 400 MHz (256QAM)	0.50%
120 kHz SCS, 7 GHz, 400 MHz (256QAM)	0.43%
120 kHz SCS, 11 GHz, 400 MHz (256QAM)	0.50%
120 kHz SCS, 7 GHz, 100 MHz 8CC (256QAM)	0.65%
120 kHz SCS, 11 GHz, 100 MHz 8CC (256QAM)	0.74%
Adjacent Channel Power	
RF output port, at –10 dBm output power, nominal	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	–60.5 dBc
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	–57.5 dBc
30 kHz SCS, 7 GHz, 100 MHz (256QAM)	–58.0 dBc
30 kHz SCS, 11 GHz, 100 MHz (256QAM)	–56.0 dBc
120 kHz SCS, 4 GHz, 200 MHz (256QAM)	–58.0 dBc
120 kHz SCS, 5 GHz, 200 MHz (256QAM)	–54.0 dBc
120 kHz SCS, 7 GHz, 200 MHz (256QAM)	–56.5 dBc
120 kHz SCS, 11 GHz, 200 MHz (256QAM)	–54.5 dBc
120 kHz SCS, 4 GHz, 400 MHz (256QAM)	–54.0 dBc
120 kHz SCS, 5 GHz, 400 MHz (256QAM)	–51.0 dBc
120 kHz SCS, 7 GHz, 400 MHz (256QAM)	–52.0 dBc
120 kHz SCS, 11 GHz, 400 MHz (256QAM)	–52.0 dBc
120 kHz SCS, 7 GHz, 100 MHz 8CC (256QAM)	–50.5 dBc
120 kHz SCS, 11 GHz, 100 MHz 8CC (256QAM)	–49.0 dBc

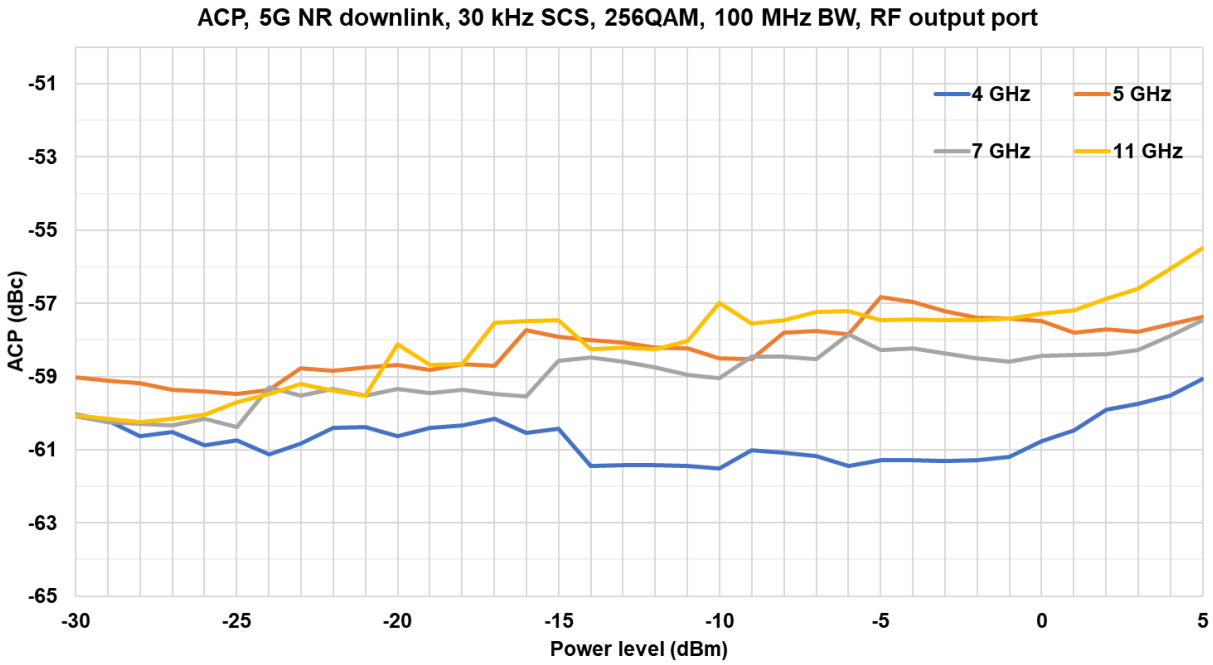

Figure 7. 5G NR downlink ACP vs. output power level, 100 MHz bandwidth, 30 kHz SCS, 256QAM

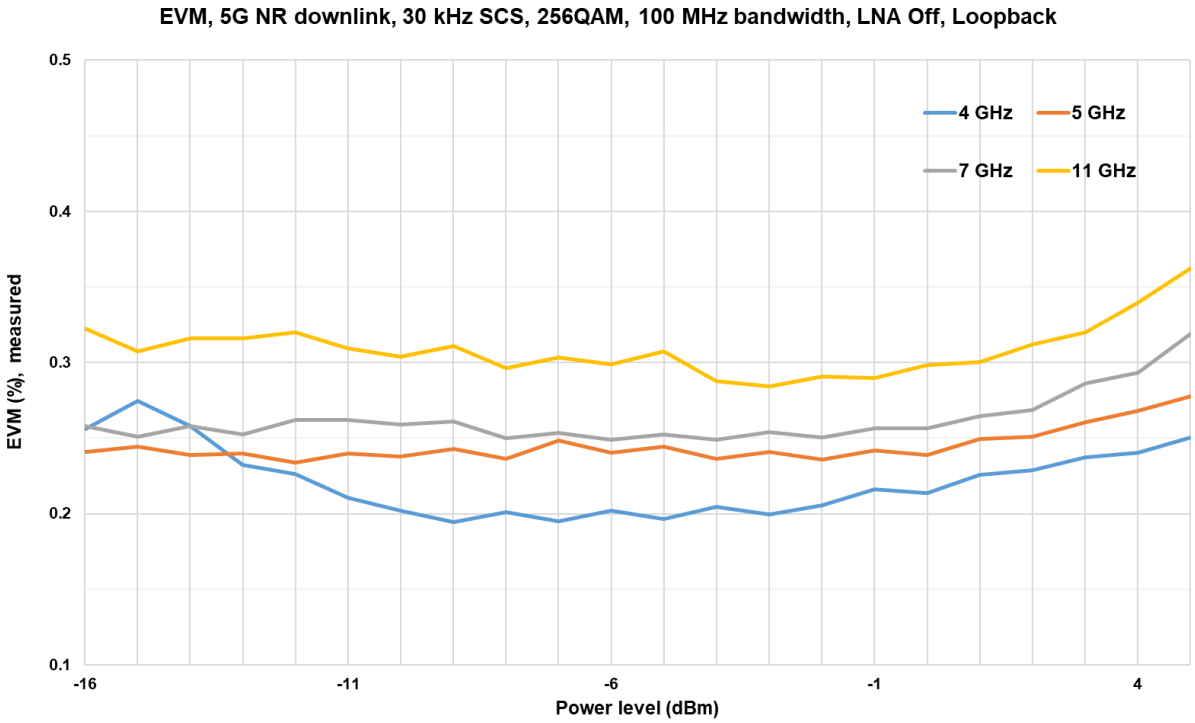

Figure 8. 5G NR downlink EVM vs. power level, LNA off, loopback, with 100 MHz bandwidth, 30 kHz SCS, 256QAM

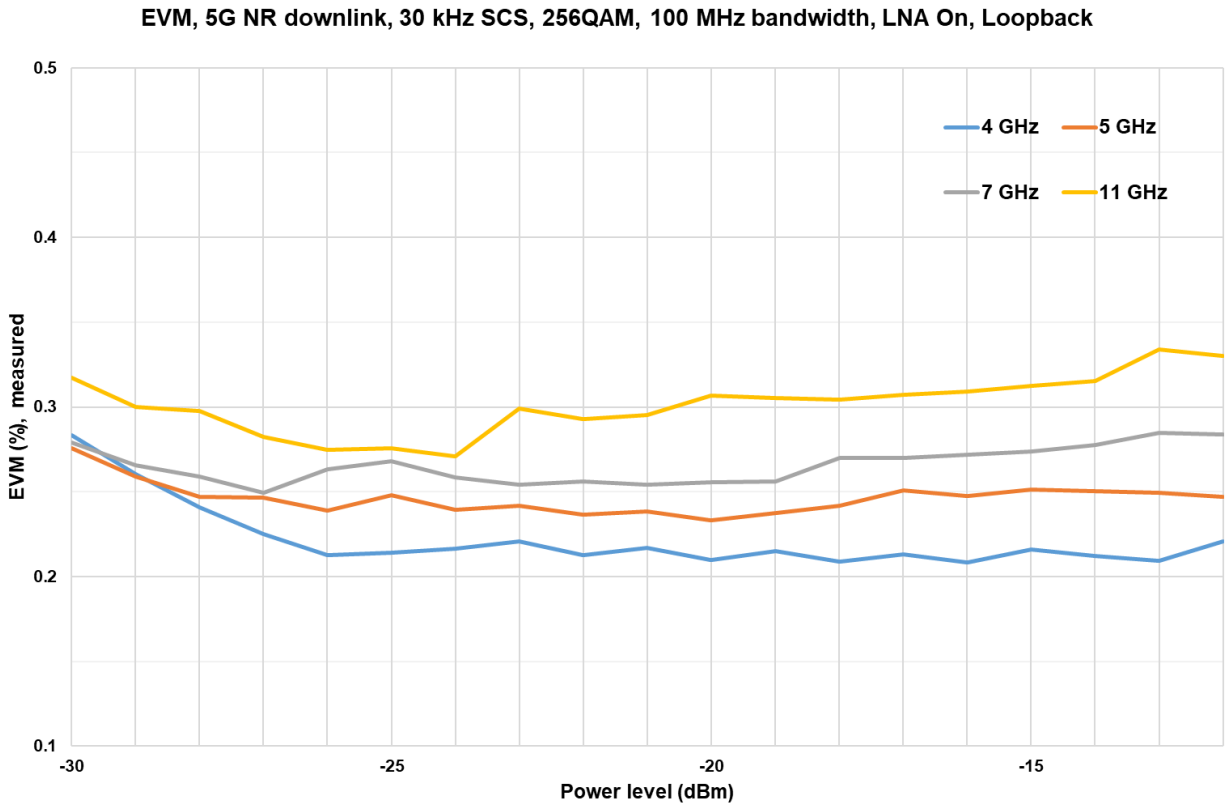

Figure 9. 5G NR downlink EVM vs. power level, LNA on, loopback, with 100 MHz bandwidth, 30 kHz SCS, 256QAM

Related Literature

For more detailed product and specification information refer to the following literature and web pages:

- M9415A VXT PXIe Vector Transceiver Configuration Guide (literature no. 3120-1477EN)
- M9018B PXIe 18 slot Chassis Data Sheet (literature no. 5992-1481EN)
- M9037A PXIe High Performance Embedded Controller Data Sheet (literature no. 5991-3661EN)
- X-Series Measurement Applications Brochure (literature no. 5989-8019EN)
- Signal Studio Software Brochure (literature no. 5989-6448EN)

Web

Product page:

- www.keysight.com/find/M9415A

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